**Acting Your Avatar’s Age:   
Effects of Virtual Reality Avatar Embodiment on Real Life Walking Speed**

# Supplementary Materials

## S1. Additional Information: Sample Size Estimation

While there are no previous studies investigating a Proteus effect of avatar age on post-embodiment walking speed, the closest related avatar effect study (Yoo, Peña, & Drumwright, 2015) reports a η² of .38 for an effect of avatar age on avatar walking speed during embodiment in a desktop setup. According to Cohen (1988, p. 284), this equates to a Cohen’s *f* of 0.78, an effect of large size (Cohen, 1992). Similarly, two priming experiments (Bargh, Chen, & Burrows, 1996) report independent samples *t*-test with *t*(28) = 2.86 and *t*(28) = 2.16 for an effect of a word task induced elderly concept on later walking speed. Conversion to Cohen’s *d* (Rosnow, Rosenthal, & Rubin, 2000) yield large effect sizes in both cases, namely *d* = 1.08 and *d* = 0.82 under the assumption of equal group sizes. It should, however, be mentioned that later replication attempts (Doyen, Klein, Pichon, & Cleeremans, 2012; Pashler, Harris, & Coburn, 2008) could not reproduce the initial priming studies’ results.

The study at hand differed from the methodologically closest study (Yoo et al., 2015) both in ways that could indicate larger expected effects, such as the use of immersive virtual reality (IVR) instead of a desktop-based embodiment, and in ways that could imply smaller effect sizes, such as a focus on post-embodiment walking behavior instead of avatar movements during embodiment. According to Cohen (1992), a Cohen’s *f* effect size index value of 0.40 would indicate a large effect, which is close to half the effect size calculated from the Yoo, Peña and Drumwright, (2015) dataset. This was presumed as a reasonable estimate of the expected effect’s size in the absence of information from more directly applicable prior experiments. For an effect of this size, an a-priori power analysis for an ANCOVA *F*-test in GPower (Faul, Erdfelder, Lang, & Buchner, 2007) indicated a total sample size of 64 participants. While incidence rates of motion sickness-like symptoms can vary widely between IVR-based experiments (Classen, Bewernitz, & Schechtman, 2011), an attrition rate of 15% was considered as an upper estimate for the current experiment, which is consistent with reported dropout rates among younger IVR users (Classen et al., 2011). This led to a targeted sample size of 74 participants.

## S2. Additional Information: Screening

Participants were recruited via mailing lists at the University of Kaiserslautern. Necessary preconditions for participation were an age range between 18 and 35 years, sufficient knowledge of the German language, an absence of a medical history related to heart or seizure related diseases, and an unremarkable history of motion sickness symptoms. These were screened with the Motion Sickness History Questionnaire (Griffin & Howarth, 2000), processed in digital form at first contact. Participants were further instructed to reschedule if they experienced even slight illness and to avoid alcohol starting on the day preceding the experiment.

## S3. Additional Analysis: Manipulation Check

Method. Participants were asked to rank the four possible avatars with regards to their walking speed. It was evaluated as a dichotomous item, which relays whether participants ranked the older avatar of their own gender as slower.

In order to test whether age-specific walking speed related stereotypes were evoked by the used avatars, a manipulation check was performed, using one-sample upper-tailed z-tests for dichotomous outcomes on the answers concerning the stereotype question against a chance level of 50%. The three tests were Holm-Bonferroni corrected for multiple tests.

**Results.** The percentages of older avatars that were ranked as slower than their same gender younger counterparts were 68.2% for participants in the young avatar (*N* = 22), 73.9% for participants in the old avatar (*N* = 23), and 77.2% participants in the control group (*N* = 22)*.* Participants ranked elderly avatars of their own gender significantly more often as slower, whether they belonged to the young avatar group, *z* = 1.705, *p* = .044, old avatar group, *z* = 2.294, *p* = .022, or the non-IVR control group, *z* = 2.558, *p* = .016.

## References

Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype activation on action. *Journal of Personality and Social Psychology*, *71*(2), 230–244.

Classen, S., Bewernitz, M., & Shechtman, O. (2011). Driving simulator sickness: An evidence-based review of the literature. *American Journal of Occupational Therapy, 65*, 179–188.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale: Erlbaum.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159.

Doyen, S., Klein, O., Pichon, C.-L., & Cleeremans, A. (2012). Behavioral priming: It's all in the mind, but whose mind? *PloS One*, *7*(1), e29081.

Faul, F., Erdfelder, E., Lang, A.G., & Buchner, A. (2007). G\*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavioral Research Methods, 39(2)*, 175–191.

Griffin, M. J., & Howarth, H. V. (2000). *Motion sickness history questionnaire.* (ISVR Technical Report No. 283). Southampton, UK: University of Southampton.

Pashler, H., Harris, C., & Coburn, N. (2008). *Elderly-related words prime slow walking.* Retrieved from http://psychfiledrawer.org/replication.php?attempt=MTU%3D

Rosnow, R. L., Rosenthal, R., & Rubin, D. B. (2000). Contrasts and correlations in effect-size estimation. *Psychological Science, 11*(6), 446–453.

Yoo, S.-C., Peña, J. F., & Drumwright, M. E. (2015). Virtual shopping and unconscious persuasion: The priming effects of avatar age and consumers’ age discrimination on purchasing and prosocial behaviors. *Computers in Human Behavior, 48*, 62–71.

Table S1

*Most common answers of IVR (N = 45) and control group participants (N = 22) when asked to name the suspected reason behind the experiment with relating percentage of participants in parentheses.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **IVR groups** | | **Non-IVR group** | |
|  |  | |  | |
| Most frequent reason | Effects of VR on  VIMS symptoms  (42.2%, 19 participants) | | Vision and attention tests (86.3%, 19 participants) | |
|  |  | |  | |
| Second most frequent reason | Vision and attention tests (31.1%, 14 participants) | | Practical applications, most commonly named: medical diagnosis (9.1%, 2 participants) | |
|  |  | |  | |
| Third most frequent reason | Practical applications,  most commonly named: test of input mechanisms for IVR (22.2%, 10 participants) | | Rest category  (9.1%, 2 participants) | |
|  |  |  |  |  |
| Categories: Avatar, walking through corridor, subjective experience of IVR,  VIMS symptoms, vision and attention tests, practical applications,  unspecific rest category | | | | | |

Table S2

*Item statistics (means (M), standard deviations (SD), response ranges and correlations between item and total score) for each item of the modified Body Ownership scale based on the complete responses by IVR group participants (N = 44).*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Item** | ***M*** | | ***SD*** | **Range** | ***r*item-total** | |
|  |  | |  |  |  | |
| I had the feeling of being in the avatar’s skin. | 3.32 | | 1.10 | [1-5] | .79 | |
|  |  | |  |  |  | |
| I sometimes completely forgot about myself because I was so focused on the avatar’s actions. | 3.55 | | 1.09 | [1-5] | .80 | |
|  |  | |  |  |  | |
| I had the feeling of actually being the avatar. | 3.59 | | 1.02 | [1-5] | .91 | |
|  |  |  |  |  |  |  |